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**AQUATIC INVERTEBRATES AND HABITAT AT A FIXED
STATION ON ROCK CREEK,
GRANITE COUNTY, MONTANA**

August 23, 2001

**A report to
the Montana Department of Environmental Quality
Helena, Montana**

**by
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May 2002**

INTRODUCTION

This report is one of 38 brief interpretive summaries of data assembled as part of a statewide, multi-year study conducted by the Montana Department of Environmental Quality (MT DEQ). Each report discusses information generated from a single benthic invertebrate sample collection and habitat evaluation at a fixed station established on a gauged river or high-order tributary. The present treatise focuses on the aquatic community sampled on the Rock Creek near Clinton, Montana on August 7, 2001. The sample site was located by GPS reading at 46° 41' 45" N, 113° 39' 53" W, lying within the Montana Valley and Foothill Prairie Ecoregion (Woods et al. 1998). The sample was collected by personnel of MT DEQ. Sampling effort consisted of either a composite of four Hess samples, or a one-minute kicknet collection (Bukantis 1998). Habitat parameters were evaluated using the MT DEQ Macroinvertebrate Habitat Assessment Field Form for streams with riffle/run prevalence. Invertebrate samples were processed and animals identified by Rhithron Associates, Inc. Analysis of invertebrate assemblages was accomplished by applying the revised method (Bollman 1998) for streams of Western Montana's ecoregions. The method uses a multimetric battery to evaluate disturbance to biotic integrity.

The revised bioassessment metric battery and its scoring criteria have not been evaluated for application to higher-order streams and rivers; to date, no bioassessment method has been contrived for these waterways in Montana. Thus, the method used here is likely to have limitations in its applicability to the sites in this study. For example, 24 of the riverine or high-order waterways sampled for the fixed station study were located within Western Montana ecoregions and were sampled between July 23 and August 25, 2001. Mean water temperature for these sites at the time of sampling was 19.8°C (median = 19.4°). Temperatures ranged from 15.5°C (Kootenai River near Libby) to 25.3°C (Jefferson River near Three Forks). Ninety-eight sites from Western Montana were used to assemble the revised metric battery and to test it for sensitivity in detecting impairment, to establish scoring criteria, and to improve robustness of bioassessment. These 98 sites were mainly second and third order streams; the sampling season roughly corresponded to that of the fixed-station study. Mean water temperature for these sites at the time of sampling was 15°C (median = 14°C). Natural variations in benthic community composition and structure along longitudinal and thermal gradients are well known phenomena. Thus, scores and classifications were established for much smaller systems with significantly lower water temperatures; impairment classifications and use support designations in this study must be interpreted with care. Results from the application of other metric batteries may be found in the Appendix.

RESULTS AND DISCUSSION

Table 1 itemizes the nine evaluated habitat parameters and shows the assigned scores for each, as well as the integrated score and condition category.

Overall habitat conditions scored optimally at this site. All instream habitat features were judged optimal, though flow conditions were perceived to be sub-optimal. Disruption was evident in streambank vegetative cover along the left bank. The riparian zone width was judged to be somewhat limited on the right bank. Field notes document the proximity of the Rock Creek Road, which closely follows the stream.

Table 1. Stream and riparian habitat assessment for a fixed station on Rock Creek. August 2001.

Max. possible score	Parameter	Rock Creek near Clinton
10	Riffle development	9
10	Benthic substrate	9
20	Embeddedness	18
20	Channel alteration	16
20	Sediment deposition	18
20	Channel flow status	15
20	Bank stability: left / right	9 / 9
20	Bank vegetation: left / right	8 / 9
20	Vegetated zone: left / right	10 / 8
160	Total	138
	Percent of maximum CONDITION*	86 OPTIMAL

*Condition categories: Optimal > 80% of maximum score; Sub-optimal 75 - 56%; Marginal 49 - 29%; Poor <23%. Adapted from Plafkin et al. 1998.

Table 2. Metric values, scores, and bioassessment for a fixed station on Rock Creek. The revised bioassessment metric battery (Bollman 1998) was used for the evaluation. August 2001.

	Rock Creek near Clinton	
METRICS	METRIC VALUES	METRIC SCORES
Ephemeroptera richness	10	3
Plecoptera richness	4	3
Trichoptera richness	6	3
Number of sensitive taxa	4	3
Percent filterers	30.8	0
Percent tolerant taxa	11.3	1
	TOTAL SCORE (max.=18)	13
	PERCENT OF MAX.	72
	Impairment classification	SLIGHT
	USE SUPPORT	PARTIAL

Bioassessment results are given in Table 2. When this bioassessment method is applied to these data, scores indicate that this site on Rock Creek is slightly impaired and only partially supports designated uses.

While the biotic index value (4.20) is slightly elevated over expectations, the number of mayflies collected in the sample suggests that water quality was essentially unimpaired at this site. Four sensitive cold stenothermic taxa were taken in the sampling effort, including the mayfly *Drunella doddsi*, and the salmonfly *Pteronarcys princeps*.

The site supported at least 4 stonefly taxa, suggesting that reach-scale habitat features such as streambank stability, riparian zone function, and channel morphology were unimpaired by human activities. Sixteen "clinger" taxa and 6 caddisfly taxa were collected, implying the availability of hard benthic surfaces unaffected by fine sediment deposition. Seven predator taxa and excellent taxa richness (37) indicate that diverse instream habitats supported a diverse community.

All expected functional components of a healthy benthic assemblage were present in the sample, although scrapers seemed to be underrepresented. The functional structure was skewed toward gatherers.

CONCLUSIONS

- Intact instream and near stream habitat and excellent water quality supported a diverse, cold-water adapted benthic community at this site on Rock Creek.
- The slight impairment indicated by the bioassessment method used appears to be inappropriate, given the taxonomic composition and tolerance characteristics of the benthic assemblage. The contribution of filter-feeders and tolerant taxa seem to be appropriate for the type of environment sampled. The biotic health at this site appears to be non-impaired.

LITERATURE CITED

Bollman, W. 1998. Improving Stream Bioassessment Methods for the Montana Valleys and Foothill Prairies Ecoregion. Master's (M.S.) Thesis. University of Montana. Missoula, Montana.

Bukantis, R. 1998. Rapid bioassessment macroinvertebrate protocols: Sampling and sample analysis SOP's. Working draft, April 22, 1997. Montana Department of Environmental Quality. Planning Prevention and Assistance Division. Helena, Montana.

Woods, A.J., Omernik, J. M. Nesser, J.A., Shelden, J., and Azevedo, S. H. 1999. Ecoregions of Montana. (Color poster with map, descriptive text, summary tables, and photographs): Reston, Virginia. US Geological Survey.

APPENDIX

Taxonomic data and summaries

Rock Creek

August 2001

Aquatic Invertebrate Taxonomic Data

Site Name: Rock Creek near Clinton

Date: 8/23/01

Site ID: C02ROCKC01

Approx. percent of sample used: 30

Taxon	Quantity	Percent	HBI	FFG
Enchytraeidae	7	2.13	11	CG
<i>Nais behningi</i>	10	3.05	8	CG
<i>Pisidium</i> sp.	1	0.30	8	CF
Total Misc. Taxa	18	5.49		
<i>Acentrella insignificans</i>	20	6.10	4	CG
<i>Baetis tricaudatus</i>	5	1.52	4	CG
<i>Dipheter hageni</i>	2	0.61	5	CG
<i>Drunella doddsi</i>	6	1.83	1	CG
<i>Drunella spinifera</i>	7	2.13	0	PR
<i>Ephemerella</i> sp.	2	0.61	1	CG
<i>Serratella tibialis</i>	17	5.18	2	CG
<i>Epeorus albertae</i>	1	0.30	2	CG
<i>Nixe</i> sp.	1	0.30	4	SC
<i>Rhithrogena</i> sp.	3	0.91	0	CG
Total Ephemeroptera	64	19.51		
<i>Sweltsa</i> sp.	1	0.30	0	PR
<i>Claassenia sabulosa</i>	1	0.30	3	PR
<i>Hesperoperla pacifica</i>	5	1.52	2	PR
<i>Pteronarcys princeps</i>	1	0.30	0	SH
Total Plecoptera	8	2.44		
<i>Arctopsyche grandis</i>	12	3.66	2	PR
<i>Brachycentrus occidentalis</i>	23	7.01	2	CF
<i>Glossosoma</i> sp.	1	0.30	0	SC
<i>Hydropsyche</i> sp.	74	22.56	5	CF
<i>Lepidostoma</i> sp.-sand case larvae	3	0.91	1	SH
<i>Psychomyia</i> sp.	1	0.30	2	CG
Total Trichoptera	114	34.76		
<i>Optioservus</i> sp.	11	3.35	5	SC
<i>Zaitzevia</i> sp.	18	5.49	5	CG
Total Coleoptera	29	8.84		
<i>Simulium</i> sp.	3	0.91	5	CF
<i>Antocha</i> sp.	2	0.61	3	CG
<i>Hexatoma</i> sp.	2	0.61	2	PR
Total Diptera	7	2.13		
<i>Cricotopus nostococladius</i>	9	2.74	6	PH
<i>Eukiefferiella Devonica</i> Gr.	1	0.30	8	CG
<i>Eukiefferiella Gracei</i> Gr.	12	3.66	8	CG
<i>Eukiefferiella Pseudomontana</i> Gr.	3	0.91	8	CG
<i>Micropsectra</i> sp.	51	15.55	4	CG
<i>Orthocladius</i> sp.	3	0.91	6	CG
<i>Pagastia</i> sp.	6	1.83	1	CG
<i>Thienemannimyia</i> Gr.	1	0.30	5	PR
<i>Tvetenia</i> sp.	2	0.61	5	CG
Total Chironomidae	88	26.83		
Grand Total	328	100.00		

Aquatic Invertebrate Summary

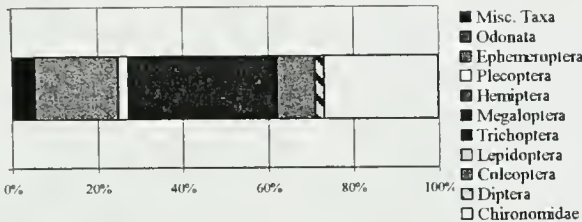
Site Name: Rock Creek near Clinton

Date: 8/23/01

SAMPLE TOTAL	328
EPT abundance	186
TAXA RICHNESS	37
Number EPT taxa	20
Percent EPT	56.71

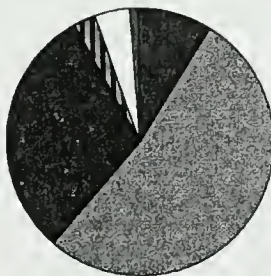
TAXONOMIC COMPOSITION

GROUP	PERCENT	#TAXA	ABUNDANCE
Misc. Taxa	5.49	3	18
Odonata	0.00	0	0
Ephemeroptera	19.51	10	64
Plecoptera	2.44	4	8
Hemiptera	0.00	0	0
Megaloptera	0.00	0	0
Trichoptera	34.76	6	114
Lepidoptera	0.00	0	0
Coleoptera	8.84	2	29
Diptera	2.13	3	7
Chironomidae	26.83	9	88



FUNCTIONAL COMPOSITION

GROUP	PERCENT	#TAXA	ABUNDANCE
Predator	8.84	7	29
Parasite	0.00	0	0
Gatherer	52.44	20	172
Filterer	30.79	4	101
Herbivore	0.00	0	0
Piercer	2.74	1	9
Scraper	3.96	3	13
Shredder	1.22	2	4
Xylophage	0.00	0	0
Omnivore	0.00	0	0
Unknown	0.00	0	0



- Predator
- Parasite
- Gatherer
- Filterer
- Herbivore
- Piercer
- Scraper
- Shredder
- Xylophage
- Omnivore
- Unknown

COMMUNITY TOLERANCES

Sediment tolerant taxa	2
Percent sediment tolerant	1.22
Sediment sensitive taxa	4
Percent sediment sensitive	7.01
Metals tolerance index (McGuire)	3.44
Cold stenotherm taxa	4
Percent cold stenotherms	7.01

Site ID: C02ROCKC01

DOMINANCE		
TAXON	ABUNDANCE	PERCENT
<i>Hydropsyche</i> sp	74	22.56
<i>Macropsectra</i> sp	51	15.55
<i>Brachycentrus occidentalis</i>	23	7.01
<i>Acentrella insignificans</i>	20	6.10
<i>Zaitzeva</i> sp	18	5.49
SUBTOTAL 5 DOMINANTS	186	56.71
<i>Serratella tubialis</i>	17	5.18
<i>Arctopsyche grandis</i>	12	3.66
<i>Eukiefferella Gracei</i> Gr	12	3.66
<i>Optioversus</i> sp	11	3.35
<i>Nais behningi</i>	10	3.05
TOTAL DOMINANTS	248	75.61

SAPROBITY

Hilsenhoff Biotic Index	4.20
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DIVERSITY

Shannon H (log _e)	2.48
Shannon H (log ₂)	3.58
Simpson D	0.09

VOLITINISM

TYPE	ABUNDANCE	PERCENT
Multivoltine	105	31.94
Univoltine	152	46.42
Semivoltine	71	21.65

TAXA CHARACTERS

	#TAXA	ABUNDANCE	PERCENT
Tolerant	4	37	11.28
Intolerant	4	23	7.01
Clinger	16	182	55.49

BIOASSESSMENT INDICES

B-IBI (Karr et al.)

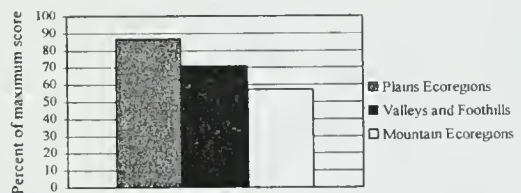
METRIC	VALUE	SCORE
Taxa richness	37	3
E richness	10	5
P richness	4	3
T richness	6	3
Long-lived	7	5
Sensitive richness	4	5
%tolerant	11.28	5
%predators	8.84	1
Clinger richness	16	3
%dominance (3)	45.12	5
TOTAL SCORE		38

76 %

MONTANA DEQ METRICS (Bukantus 1998)

METRIC	VALUE	Plains Ecoregions	Valleys and Foothills	Mountain Ecoregions
Taxa richness	37	3	3	3
EPT richness	20	3	3	3
Biotic Index	4.20	3	2	1
%Dominant taxon	22.56	3	3	3
%Collectors	83.23	1	1	0
%EPT	56.71	3	2	2
Shannon Diversity	3.58	3		
%Scrapers + Shredd	5.18	1	0	0
Predator taxa	7	3		
%Multivoltine	31.94	3		
%H of T			3	
TOTAL SCORES		26	17	12
PERCENT OF MAXIMUM		86.67	70.83	57.14
IMPAIRMENT CLASS		NON	SLIGHT	SLIGHT

Montana DEQ metric batteries



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